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Abkürzungen wird auf die Erklärungen ("Guidance Notes on
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(54) Title: HMLS-FIBERS MADE OF POLYESTER AND A SPIN-STRETCH PROCESS FOR ITS PRODUCTION

(54) Bezeichnung: HMLS-FÄDEN AUS POLYESTER UND SPINNSTRECKVERFAHREN ZU DEREN HERSTELLUNG

(57) Abstract: HMLS-fibers consisting of a polyester, 0.1 to 2.5 weight % incompatible, thermoplastically workable, amorphous polymeric additive with a glass transition temperature of 90 to 170 °C and a melt viscosity ratio relative to the polyester component of 1:1 to 7:1, and 0 to 5.0 weight % of usual additives, whereby the polymeric additive is present in the fibers in the form of fibrils with a mean diameter of ≤ 80 nm. The invention further relates to a method for the manufacture of HMLS-fibers comprising static mixing and shearing of the polyester and the polymer additive and optionally the other additives. The mixture undergoes spinning at a speed of 2500 to 4000 m/min to produce spun fibers. Said fibers are then stretched, thermally fixed and wound. The concentration of polymer additives is determined as a function of the prescribed spinning rate and the desired refractive index of the spun fibers.

(57) Zusammenfassung: HMLS-Fäden, bestehend aus einem Polyester, 0,1 bis 2,5 Gew. -% inkompatiblen, thermoplastisch verarbeitbaren, amorphen polymeren Additivs mit einer Glasumwandlungstemperatur von 90 bis 170 °C und einem Verhältnis seiner Schmelzeviskosität zu der der Polyesterkomponente von 1:1 bis 7:1, und 0 bis 5,0 Gew. -% üblicher Zusatzstoffe, wobei das polymere Additiv in den Fäden in Form von Fibrillen mit einem mittleren Durchmesser von ≤ 80 nm vorliegt. Verfahren zur Herstellung dieser HMLS-Fäden durch statisches Mischen unter Scherung des Polyesters und des polymeren Additivs sowie ggf. der Zusatzstoffe, Verspinnen der Mischung bei einer Spinnabzugsgeschwindigkeit von 2500 bis 4000 m/min zu Spinnfäden, die verstreckt, thermofixiert und aufgewickelt werden, wobei die Konzentration des polymeren Additivs als Funktion der vorgegebenen Spinnabzugsgeschwindigkeit und der gewünschten Doppelbrechung der Spinnfäden bestimmt wird.

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TITLE: High-modulus, low-shrinkage polyester filament, used e.g. for production of tire cord, contains dispersed fibrils of an incompatible, thermoplastically processable, amorphous polymeric additive

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CODE

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ZIMV

ROEHM GMBH CHEM FAB

ROHG

ROEHM GMBH

ROHG

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ABSTRACTED-PUB-NO: DE 19937728A

BASIC-ABSTRACT:

NOVELTY - HMLS polyester filaments containing 0.1-2.0 wt.% of an incompatible, thermoplastically processable, amorphous polymeric additive (b) with a Tg of 90-170 deg. C, in which the ratio of the melt viscosity of (b) to that of the polyester (a) = (1:1)-(7:1) and (b) is in the form of fibrils with an average diameter of not more than 80 nm, dispersed in

component (a).

DETAILED DESCRIPTION - HMLS (high-modulus low-shrinkage) polyester filaments with a tensile strength of more than 70 cN/tex, an LASE 5 value (force corresponding to an elongation of 5%) of more than 35 cN/tex and a hot air shrinkage (at 160 deg. C) of 1.5-3.5%, comprising:

- (a) a polyester containing at least 85 mol% poly-(2-4C alkylene) terephthalate;
- (b) 0.1-2.5 wt.% of an incompatible, thermoplastically processable, amorphous polymeric additive with a glass transition point in the range 90-170 deg. C; and
- (c) 0-5 wt.% conventional additives.

The ratio of the melt viscosity of (b) to that of (a) = (1:1)-(7:1) and additive (b) is present in the form of fibrils with an average diameter of not more than 80 nm, dispersed in component (a).

An INDEPENDENT CLAIM is also included for a process for the production of HMLS filaments by:

- (1) melt-compounding the above components in a static mixer with a shear rate of 16-128 sec⁻¹ and with the product of the shear rate and the 0.8th power of the dwell time in the mixer (in seconds) adjusted to a value of at least 250;
- (2) melt-spinning at 2500-4000 m/min.; and
- (3) preparing, stretching, heat-fixing the filaments and winding on a spool.

In this process the concentration c (wt.%) of (b) in the polyester is within the range x.f1-x.f2, in which:

$f1 = 100.(\Delta n_0 - \Delta n) / \Delta n_0(7.2589.10^{-6}.v^2 - 7.7932.10^{-2}.v + 236.0755)$ $f2 = 100.(\Delta n_0 - \Delta n) / \Delta n_0(5.9391.10^{-6}.v^2 - 6.3763.10^{-2}.v + 193.1527)$.

v = take-off rate (m/min); Δn = required birefringence of the spun filament with additive (b); Δn_0 = birefringence without (b); Δn = less than Δn_0 ;

x = 1 for additives of type (b1) or (b3) as defined below, or x = 2.8 for additives of type (b2) (without acrylic monomer units).

USE - As yarn for industrial applications, e.g. tire cord.

ADVANTAGE - High-modulus, low-shrinkage polyester fibre with a high tensile strength, made by a spin/stretch process with final speeds of more than 6000 m/min with minimal capillary breakage (even when using high-viscosity polyester). High spinning speeds are achieved without chemical modification of the polyester (i.e. without reducing the flexibility of the spinning system) and the fibres can be custom-made for various applications by varying the birefringence within the range 0.030-0.055, irrespective of spinning speed.

CHOSEN-DRAWING: Dwg.0/0

TITLE-TERMS: HIGH MODULUS LOW SHRINK POLYESTER FILAMENT PRODUCE CORD CONTAIN DISPERSE FIBRIL INCOMPATIBLE THERMOPLASTIC PROCESS AMORPHOUS POLYMERISE ADDITIVE

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